Transmuting Iron into Gold

Army Worldwide Environmental and Energy Conference 2000

al·che·my

- **al·che·my** (*noun*)
- A medieval chemical philosophy having as its asserted aims the transmutation of base metals into gold, the discovery of the panacea, and the preparation of the elixir of longevity.

DOD is uniquely positioned to profit from DG

- **DOD can deliver its generators as a block**

- **DOD is connected at the transmission level**

DOD can meet international standards in…

- Environment
- Interconnect
- Export
- QOS

…not arbitrary local standards

- **DOD has world class experience in networks**

Questions and Answers

- **What is Distributed Generation (DG)?**

- **How should DOD participate?**

- **What is a fair expectation of value?**

- **Will DOD standby power be better or worse?**

- **What new capabilities will be realized?**

- **Are their any environmental concerns? Advantages? Solutions?**

- **What if the generator supports a "no-break" facility**

Convergence
Network Distributed Resources

Sophistication of Distributed Intelligent Devices

***the* INTERNET cost of info drops**

Moore's Law (Information capability doubles every 18 months)

Changing Customer Behavior (Outsourcing)

**New Economics marginal not average Cost - Value**

- Customers see great value in out sourcing energy management to drive competitiveness and operational effectiveness:

- Resulting in the customer demanding:

  - Optimal suites of result based energy solutions

  - Collection and translation of real time data to business metrics for improved operations

  - Branding of the bundle - results not the discrete services or technology

Network Distributed Resources (e.g.Gen Sets, HVAC, DSM)

To understand the opportunity you first have to understand
ENERGY's ... *total cost*

- fuel
- generation
- environmental
- capacity
- transmission
- distribution
- loss
--------------------------- Service Entrance
- physical plant
- DSM
- risk
- heat
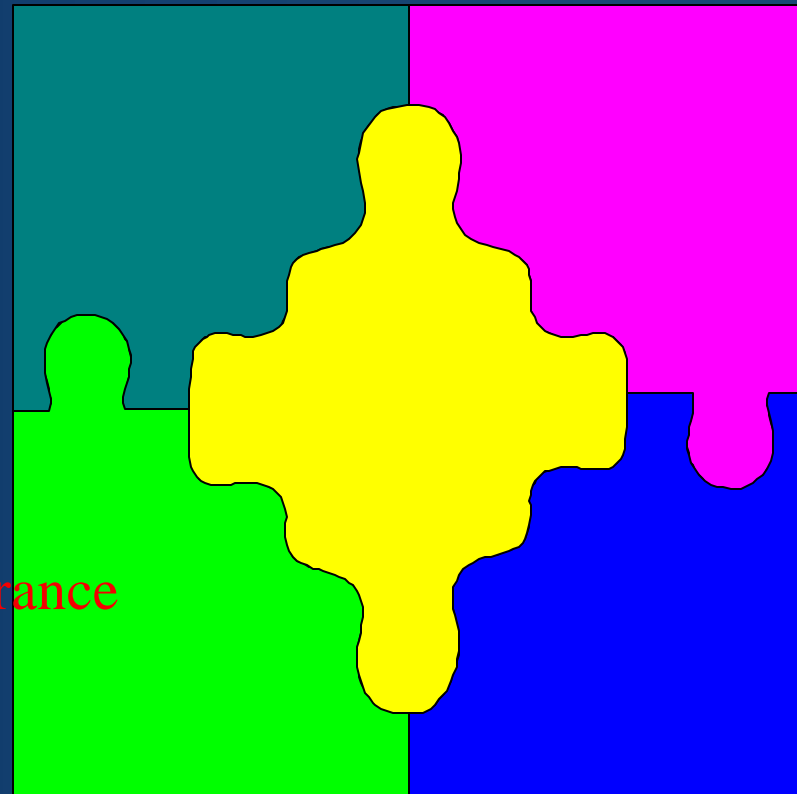
The Changing Electric Utility *Paradigm*

SUPPLY

$ per unit of *energy*

DEMAND

***energy* per unit of production**
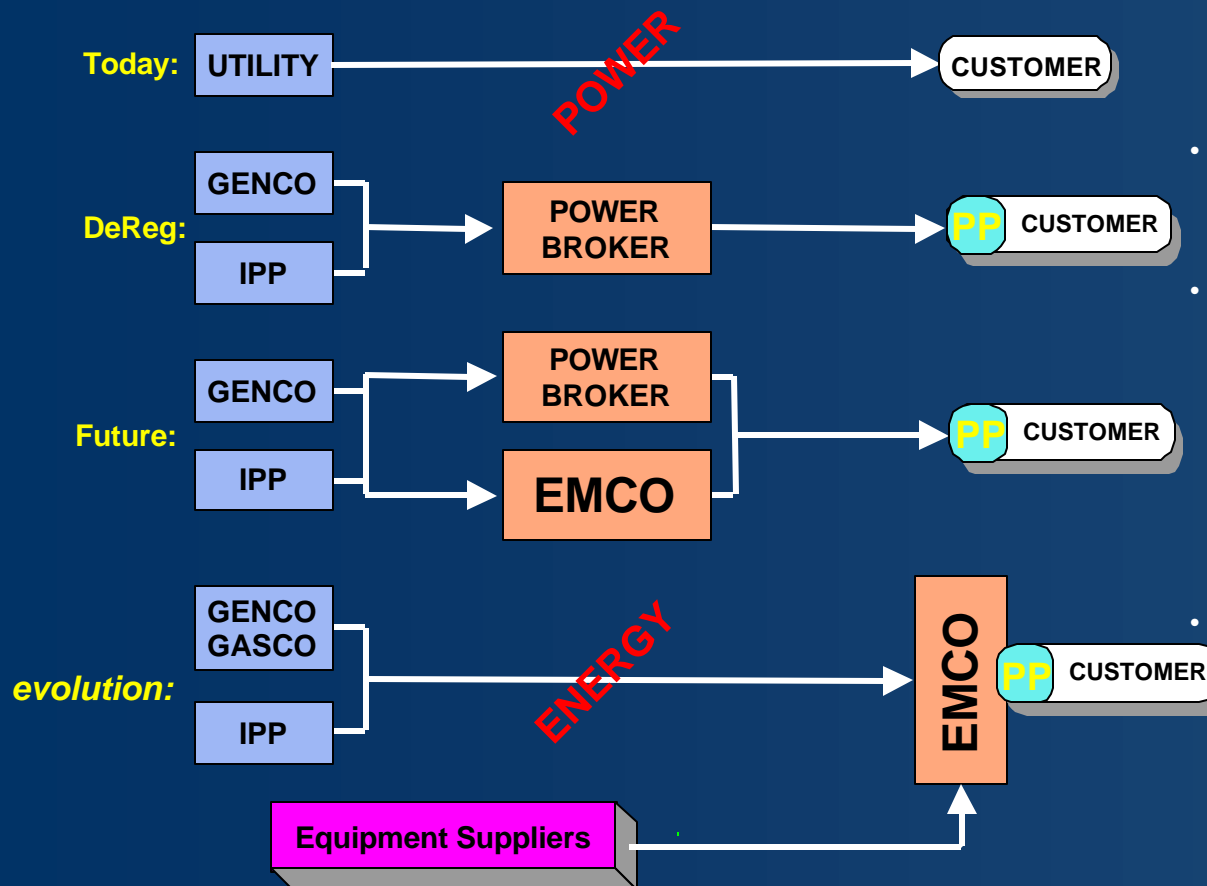
The evolving *ENERGY* industry?

...the emerging EMCO

Today: UTILITY → POWER → CUSTOMER

DeReg:
GENCO
IPP
→ POWER BROKER → CUSTOMER

Future:
GENCO
IPP
→ POWER BROKER
EMCO → CUSTOMER

evolution:
GENCO GASCO
IPP
→ ENERGY → EMCO → CUSTOMER

Power Exchange

DISCO

Networked Distributed Resources

Equipment Suppliers
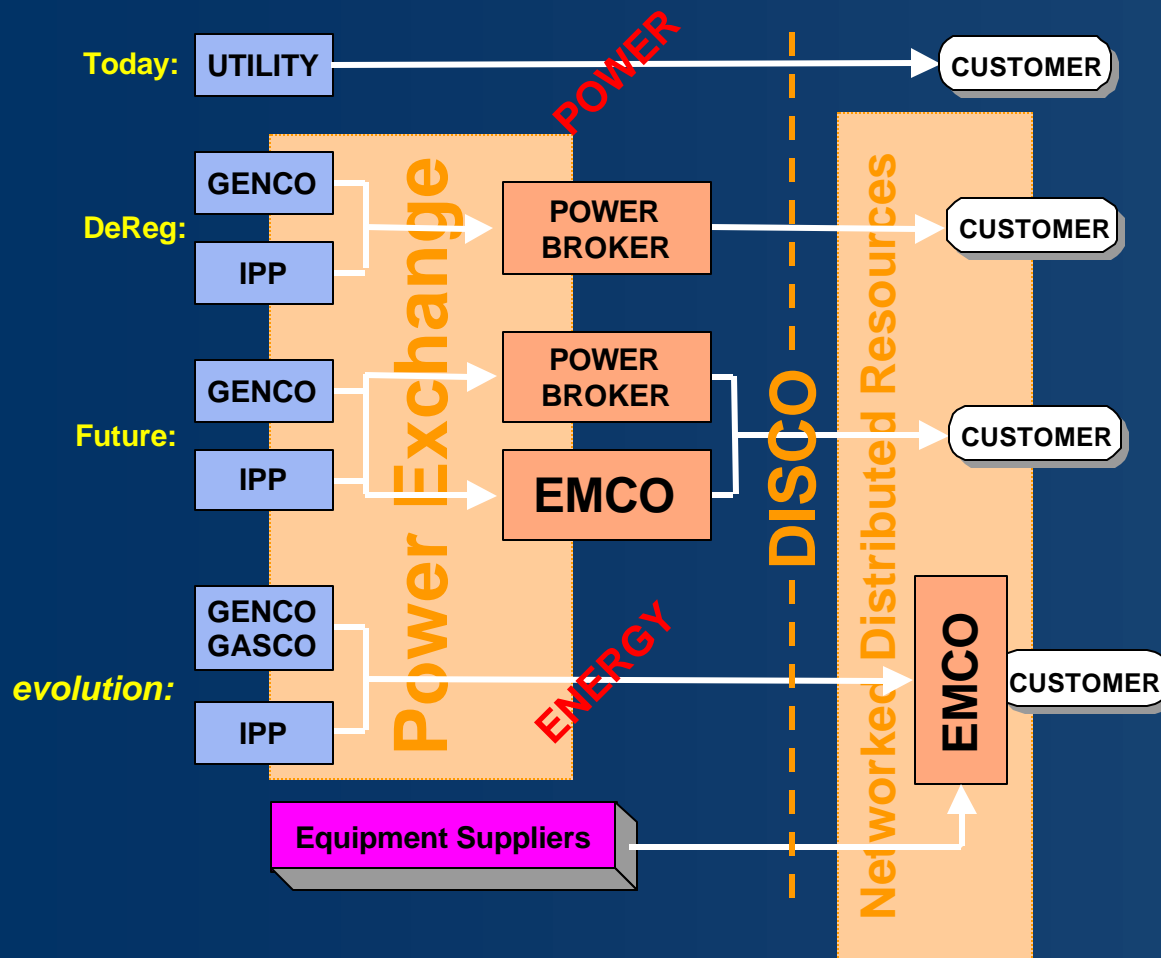
- **UTILITY** sells power to customers
- **GENCO** sells bulk power to PX
- **DR** *emerges* serving supply side
  – capacity - bulk power - ancillary services
- **DR** *expands* towards customer's side
  – QOS - risk – DSM – efficiency - consumption
- **EMCO - E**nergy **M**anagement **Co**mpany
  – differentiates from Power Broker
    - value added energy "**SERVICES**"
    - marginal value of energy vs commodity cost
  – capture DR locational values of customer
  – manages customer's energy risk
    - QOS = productivity & yield
    - energy bulk commodity cost
  – manage customer's interaction with **DISCO**
    - real vs apparent power
    - harmonics
    - DSM
    - information
    - Distributed Resources
- **EMCO**'s will manage all energy sourcing, operation, quality and many of the Customer's energy capital equipment purchases
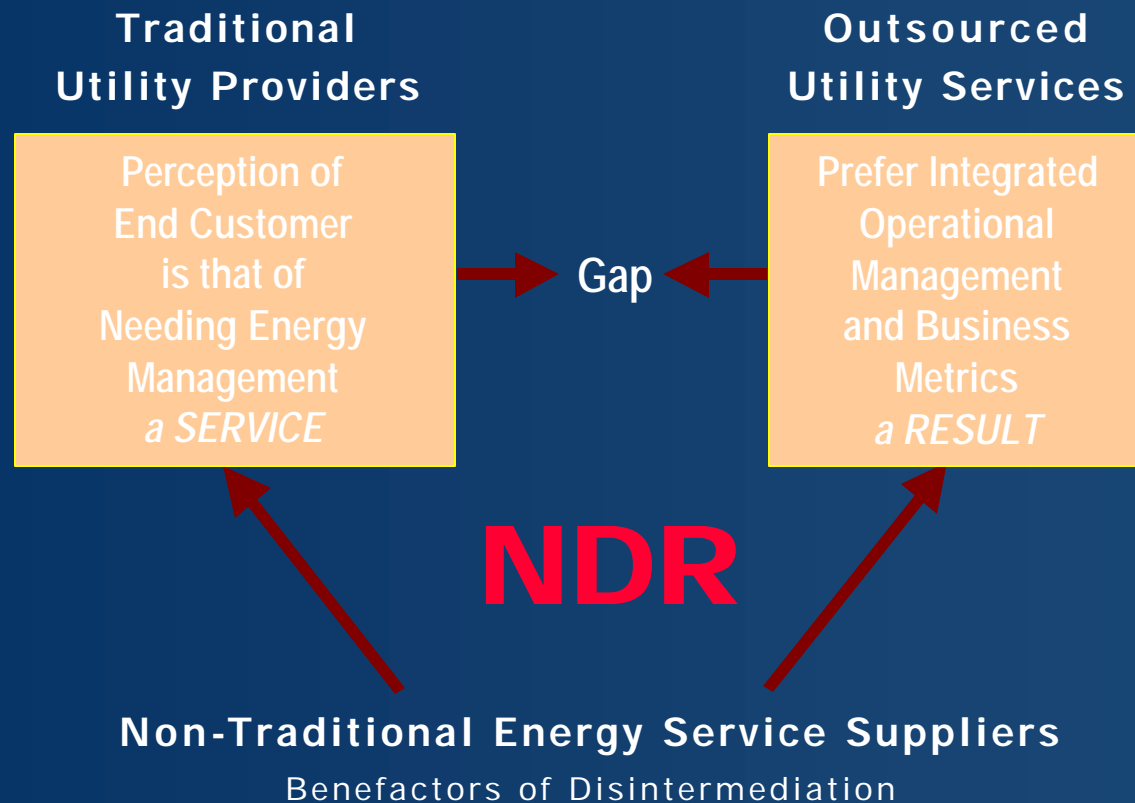
Change in the *ENERGY* industry?

...the PowerPortal

Today: UTILITY ——POWER——→ CUSTOMER

DeReg: GENCO, IPP → POWER BROKER → PP CUSTOMER

Future: GENCO, IPP → POWER BROKER / EMCO → PP CUSTOMER

evolution: GENCO GASCO, IPP ——ENERGY——→ EMCO → PP CUSTOMER ; Equipment Suppliers → EMCO
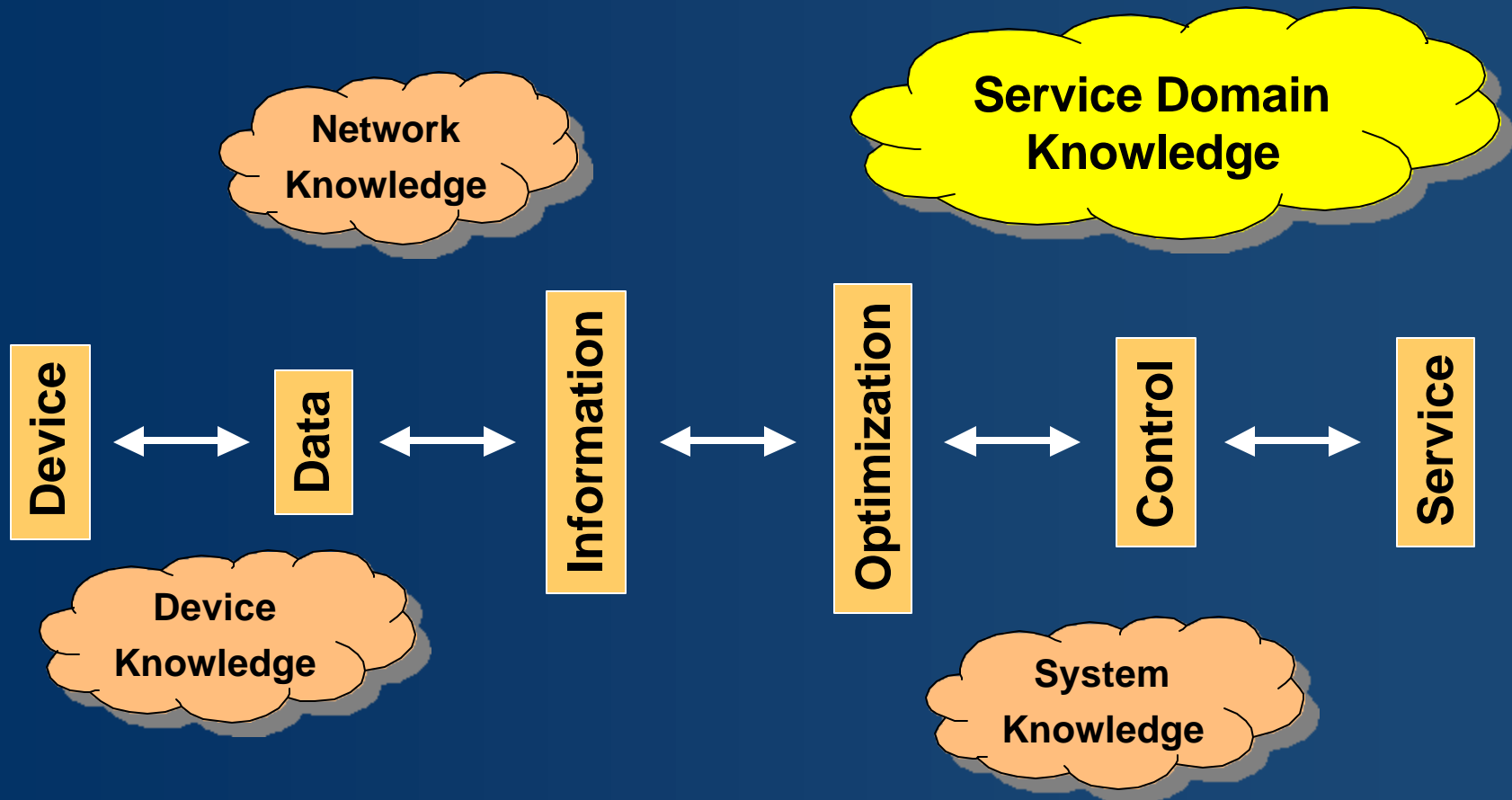
- **Mass Customization -** giving each customer the unique services he wants in a competitive market will be the significant differentiator in the Deregulated market, not the lowest cost per kW
- **Communication** and information flow will be the enabler that makes Mass *energy* Customization possible.
- Questions
  - Will high bandwidth become so low cost that anything can be wired directly to it or will low bandwidth require aggregation before connecting to high?
  - Will a DISCO's *right of way* have value as the aggregator of low bandwidth or will wireless, telco, broadband prevail?
- PowerPortal
  - the logical aggregator of energy information
  - can also be used for status monitoring and alarm and as a push channel for community info like the French MiniTel system
  - It is the logical manager for Distributed Resources, as well as all AMR.
- A new business opportunity for EMCOs

The "Gap"

**Traditional
Utility Providers**

**Outsourced
Utility Services**

Perception of
End Customer
is that of
Needing Energy
Management
a SERVICE

Gap

Prefer Integrated
Operational
Management
and Business
Metrics
a RESULT

NDR

Non-Traditional Energy Service Suppliers

Benefactors of Disintermediation

Information Flow....
...the essential ingredient for creation of Added Value
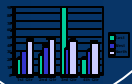
Industrial Customers

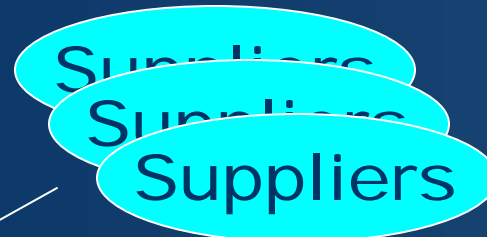Commercial Customers w/Gen Sets, and modest reliability sophistication.

Customers

Dashboard Portal Provides platform for community of like customers

Suppliers
Suppliers
Suppliers

"suppliers value eye balls"

$$ (Future Value)

Transaction fees with suppliers "Portal Real-Estate" fees

$$ (Annuity)

- "Gold Service" subscription
- Dashboard
- Maintenance (gen set)
- Energy Supply services

EMCO

$$ (Opportunistic)

Management Dashboard

Risk Management
Business
Performance
Measures

PowerPortal

C&C

Infrastructure (Delivery Platform) real-time monitoring & control

Commercial Customers w/Gen Sets, and modest reliability sophistication.

Trader

Supply Deals
Access to DR
Peak Shave Deals

Dashboard Application used by Customers

Large Variation in Electricity Costs Today
Wide Variation in Demand, Some Plants Used <200 Hours/Year

Peaking (Quick Dispatch)

Super-peaking

Base Load + Spinning Reserve

Cash Operating Costs ¢ / Kwh

Variable Cost of Genset Operation

Cumulative Supply (GW)
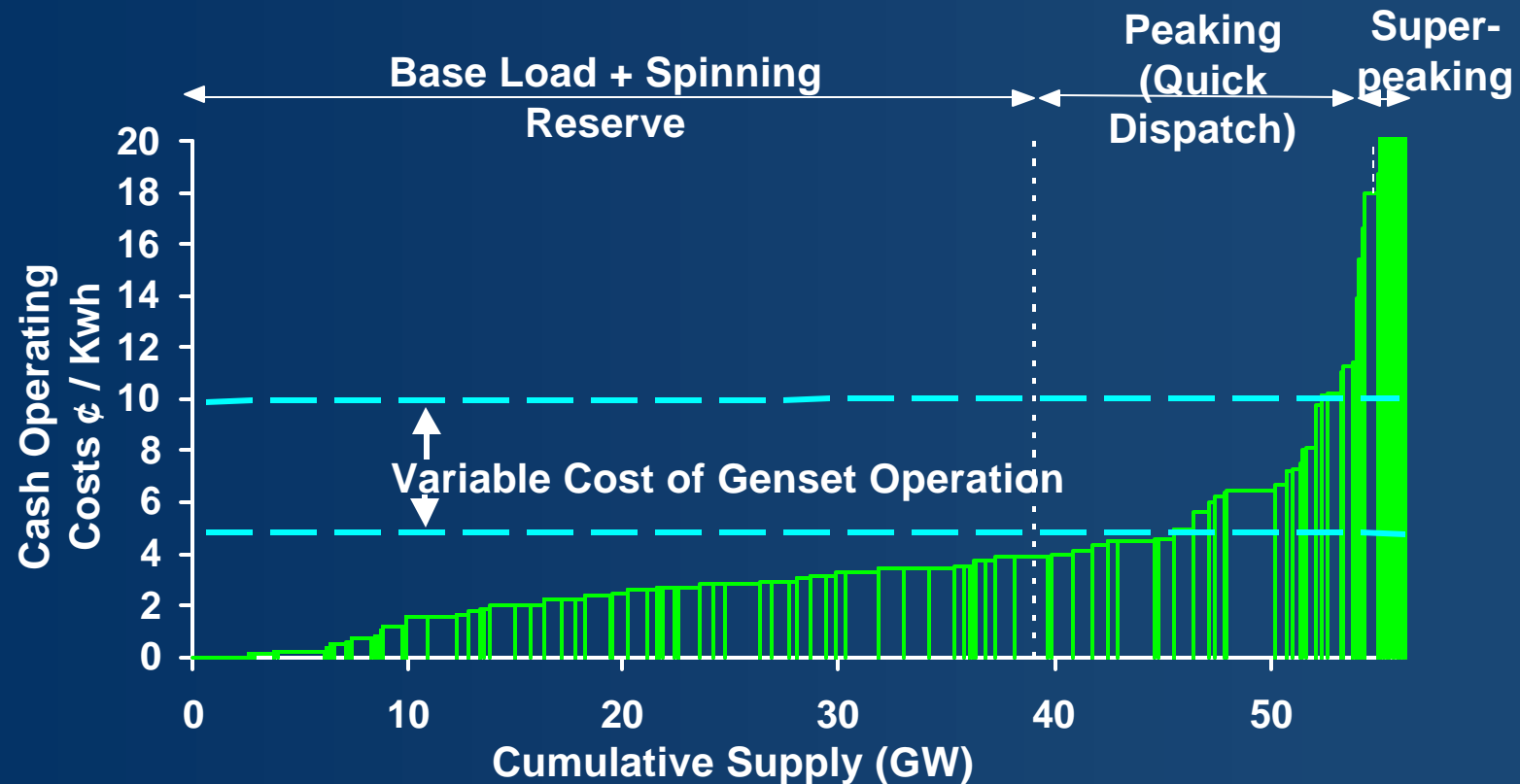
Deaveraged Pricing Will Encourage Customers to Find Other Ways to Meet Their Needs During Peak Periods

Benefits of Peak Sharing

CUSTOMERS

- Utility customers save on electricity costs by turning idle standby generators into revenue-producing assets (through real-time, time-of-use, or interruptible rates)
- Standby generators are tested under real-life conditions with "blipless" power transfers
- Generators run for less than 150 hours per year to "generate" BIG SAVINGS!

UTILITIES

- Dispatchable peak demand reduction
- Maximum use of standby capacity through safe parallel operation with the utility grid
- Cost-effective solution
- Improved system load factor/grid stability
- Improved customer relations

Third Party (EMCO):

- contracts with customer for energy supply, lower energy costs QOS.
- sites power generation at customer
  - used for emergency
  - used for "reserve generation capacity"
  - used for power sale to grid to highest bidder
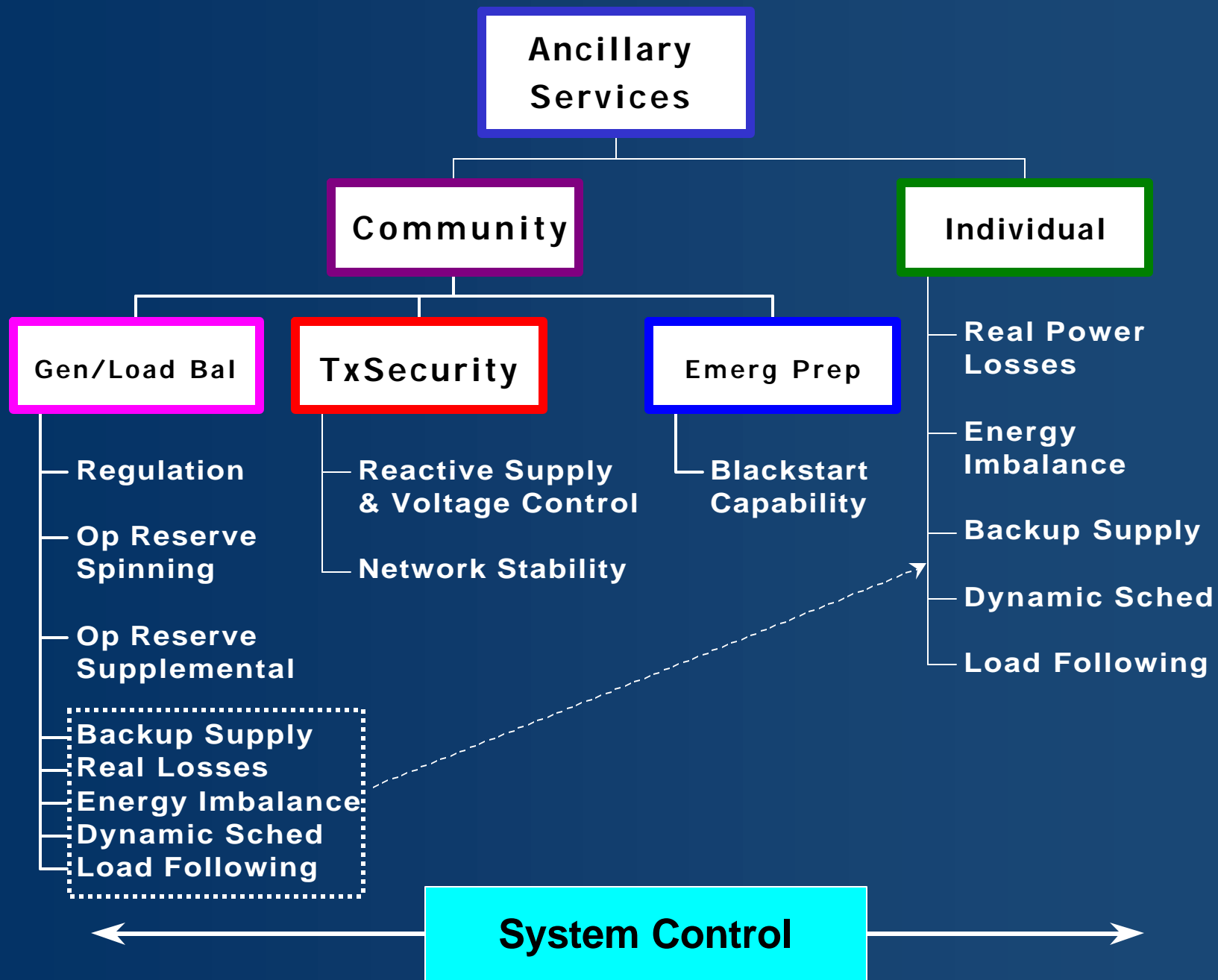
Why a third party makes sense.

Two Revenue Streams Created:
One From User/Customer
Another From Power Marketers

Limitations of Peak Sharing Programs Currently in Place

- **Manual Operation - low reliability / load disruption**
- **No real data feedback to Utility - tracking of customer genset usage, billing & crediting is hard to understand, safety concerns**
- **Open Transition "break before make" is hard on customer and utility equipment**
- **Lack of automation**
- **Funded Utility DSM Programs under review (short term?)**
- **Complex Sale:**
  - **High Capital Cost/Budget Constraints**
  - **Disruption To Service**
  - **Non-Friendly Utilities (Interconnect Difficult/Expensive)**
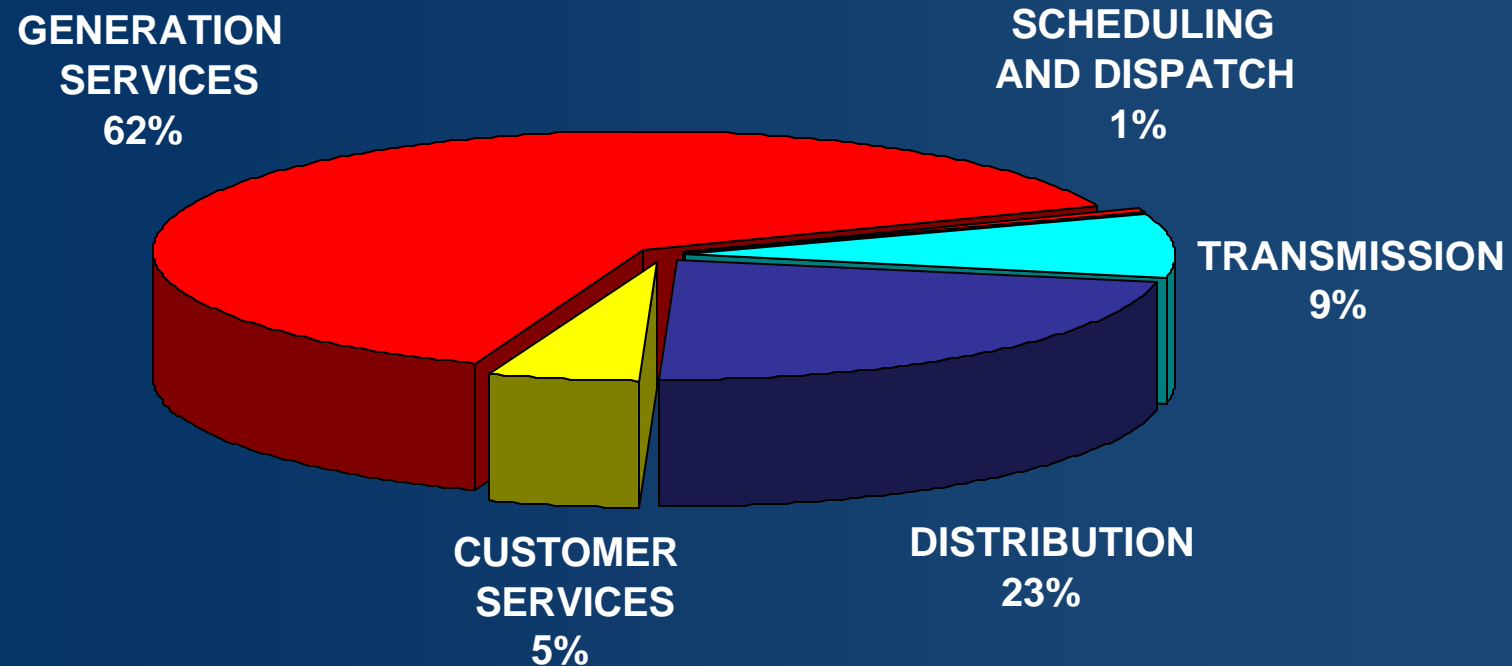

If it's so attractive, why isn't it being done today? Where's the demand?
What dynamic has changed to create demand?   None...Yet!

Fast Forward: EMCO's will create demand - knowledgeable users
                National Interconnect Standard will be created
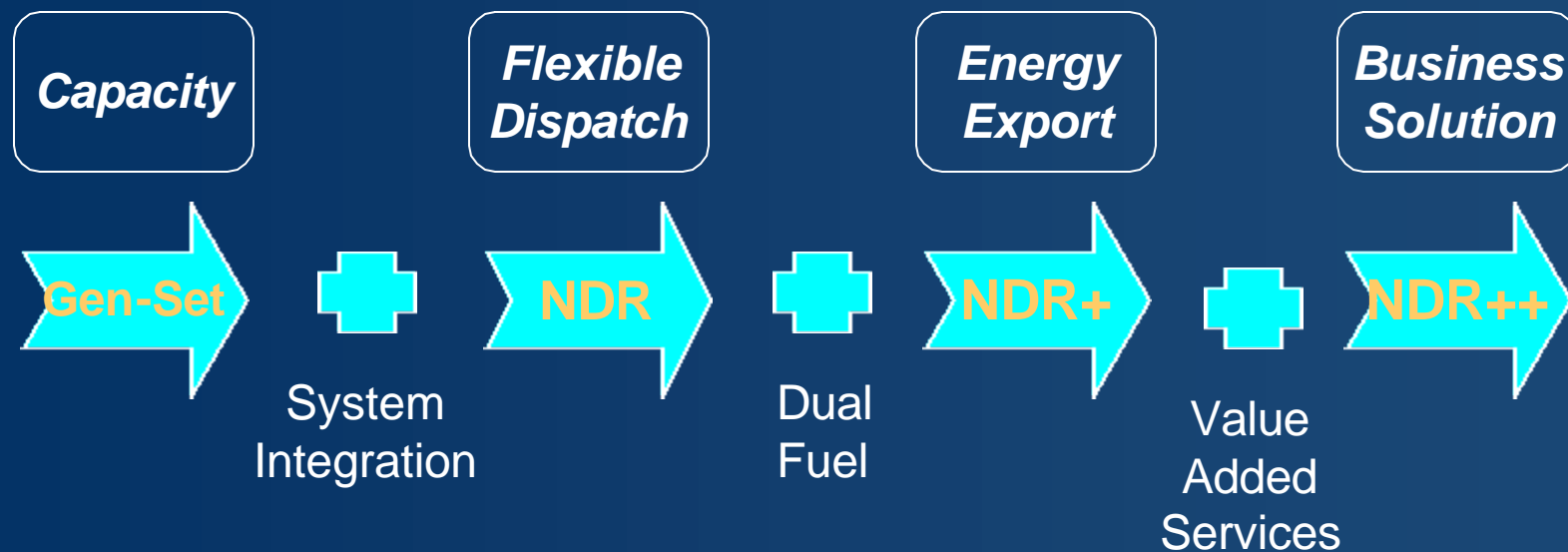   Utilities will become see opportunity for profit.

Ancillary Services

Community

Gen/Load Bal

— Regulation

— Op Reserve Spinning

— Op Reserve Supplemental

— Backup Supply
— Real Losses
— Energy Imbalance
— Dynamic Sched
— Load Following

TxSecurity

— Reactive Supply & Voltage Control

— Network Stability

Emerg Prep

— Blackstart Capability

Individual

— Real Power Losses

— Energy Imbalance

— Backup Supply

— Dynamic Sched

— Load Following

System Control

Value of Capacity -- Generation Represents 62% of Utility "Value Chain"

**UTILITY REVENUE GENERATION BY SERVICE TYPE
TOTAL VALUE: $200 BILLION**

GENERATION
SERVICES
62%

SCHEDULING
AND DISPATCH
1%

TRANSMISSION
9%

DISTRIBUTION
23%

CUSTOMER
SERVICES
5%

Networked Distributed Resources

Capacity		Flexible Dispatch		Energy Export		Business Solution
Gen-Set	System Integration	NDR	Dual Fuel	NDR+	Value Added Services	NDR++

…this path continually grows with the addition of new Technologies
and
new Services for both the Utility and end customer

# DG Applications & Locational Value

APPLICATIONS

- Prime Power
- Small Power Plants (SPP)
- Standby/Emergency
- Load Management
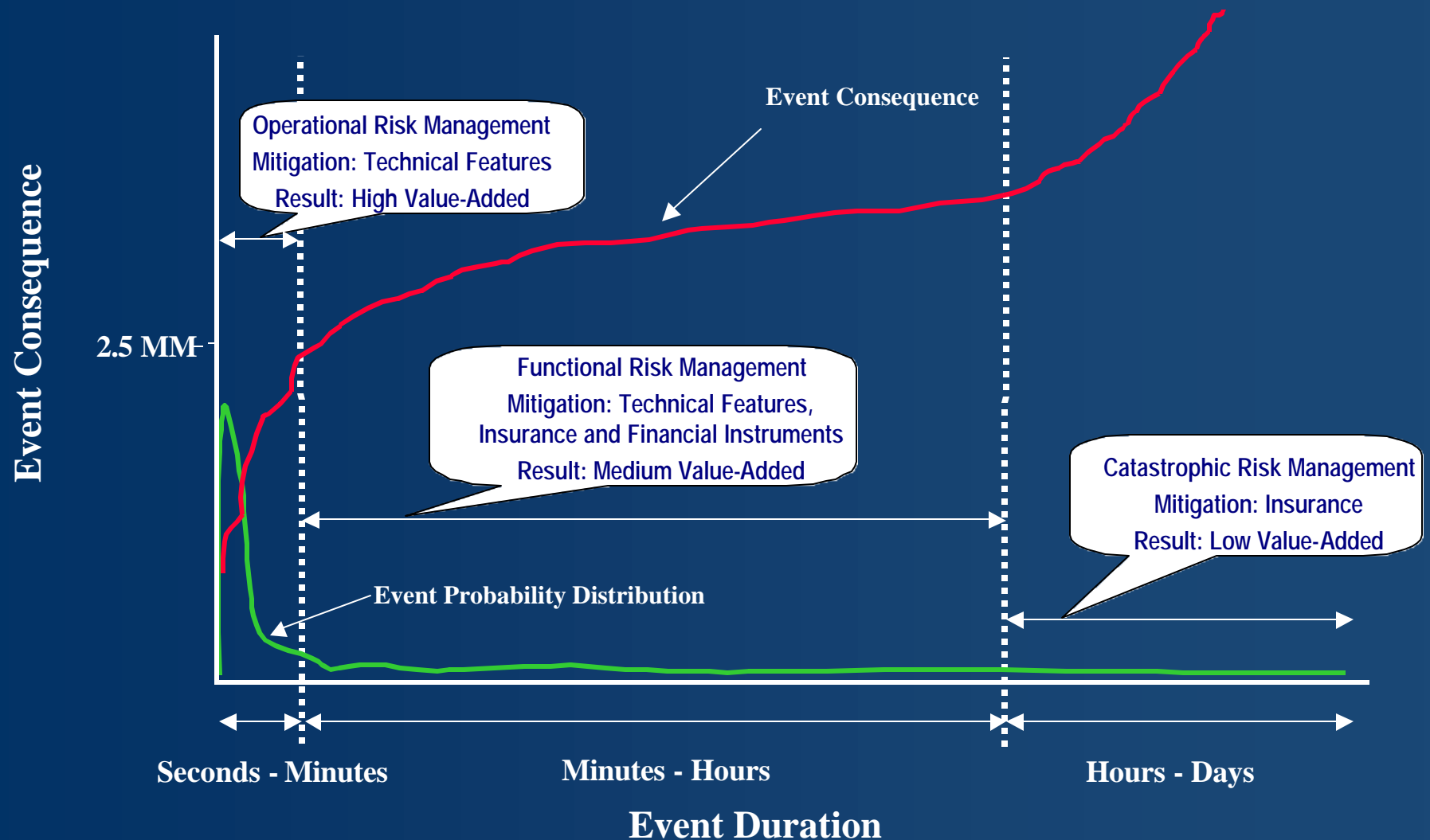- Individual & Fleet Rental/Leasing

LOCATIONAL VALUE

- Networked Distributed Resource Facility (NDR)
- Combine Heat/ Power (CHP)
- Power Quality (PQ)
- Flexibility to match varying loads at different locations
- User Outsourcing
- Ancillary Services

Power System Value Chain
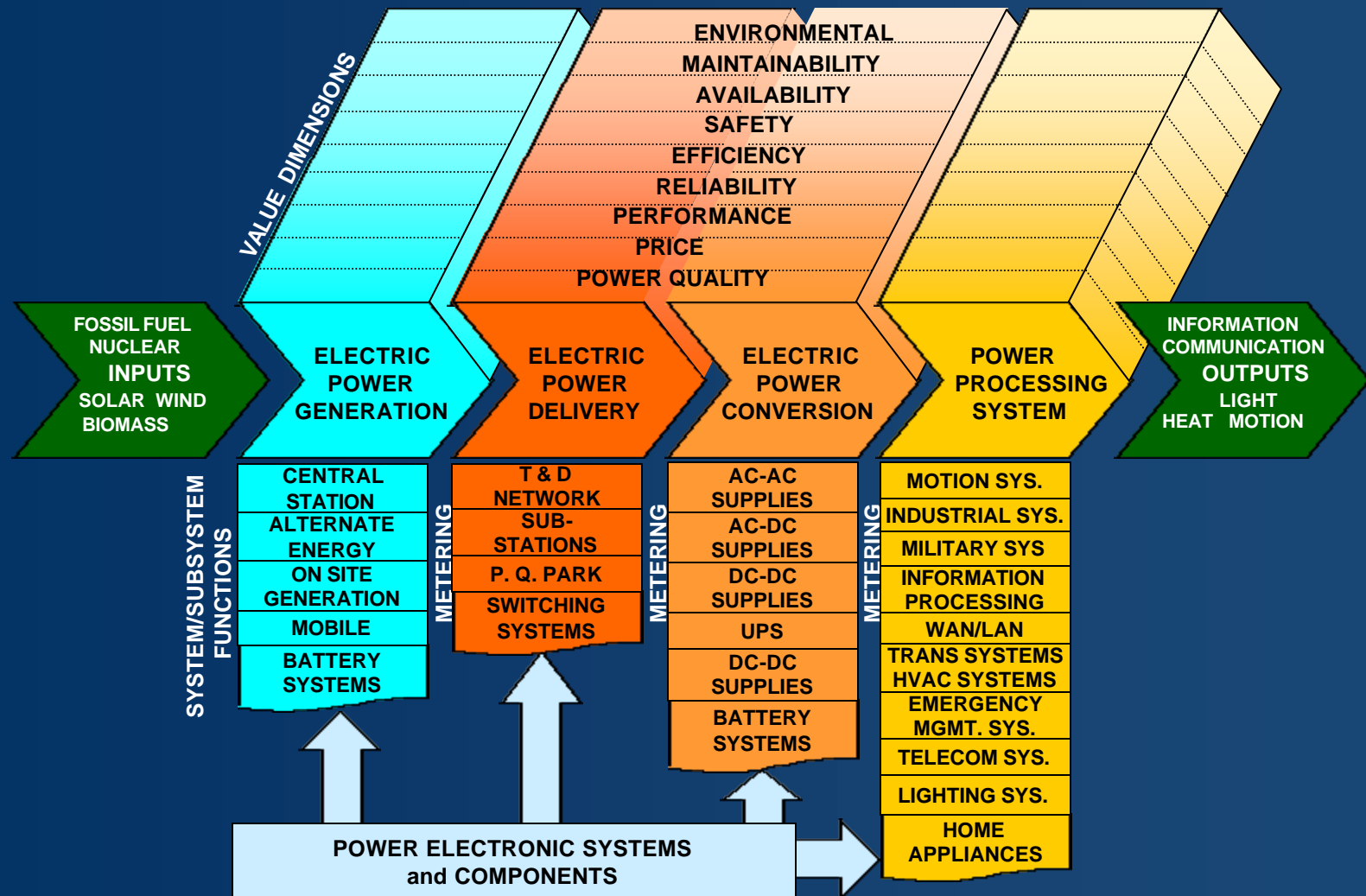
How big is the pie?

- **12,500 TWh of electricity per year**

- **>$3T revenue**

- **$350B in USA**

- **$1.4T of generating assets**

- **$270B of new G+T+D assets per year**

- **US QOS loses >$ 50B per year due to power related events**

- **World QOS loses >$240B per year due to power related events**

Networked Distributed Resources (NDR) can…

- ✓ **meet or exceed all current DOD needs for standby generation**

- ✓ **have a higher system availability than current**

- ✓ **improve DOD's FEMA support**

- ✓ **translatable to the battlefield – one shell will not knock down the grid**

- ✓ **be used by civil administration - will return power to administered areas more quickly than conventional**

- ✓ **report to ACOE (Army Common Operating Environment)**

- ✓ **improve DOD's energy/environment position**

- ✓ **lower base housekeeping O&M costs**

- ✓ **improve Distribution System load factor**

- ✓ **conform to current DOD housekeeping practices while interfacing with the Utility grid**